SEMICONDUCTOR ELEMENT MODULE AND SEMICONDUCTOR DEVICE WHICH PREVENTS SHORT CIRCUITING

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a semiconductor element module and a semiconductor device.

2. Description of the Related Art

An explanation will be given of the case where a semiconductor element is an optical element (light emitting element, light receiving element). FIG. 7A is a side view of a conventional semiconductor element module; FIG. 7B is a side view of FIG. 7A; and FIG. 7C is a front view taken in line A—A' in FIG. 7A.

In these figures, reference numeral **1** denotes an optical element for converting an electric signal into an optical signal and vice versa; **2** an optical fiber for transmitting the optical signal; **3** a mount for adjusting/fixing the optical axes of the optical element **1** and optical fiber **2**; **4** a package for hermetically sealing the optical element; **5** one of wires for connecting the optical element **1** and package **4**; **6** one of leads, provided on both sides of the package **4** so that an opening end is oriented to the a package attaching plane, for connecting the optical element and external circuit; and **7** one of brazing materials for connecting the package and the leads **6**. The wire **5** and leads **6** are electrically connected to each other through the package **4**. FIG. **8**A is a side view of a semiconductor device in which a conventional semiconductor element module is mounted on a substrate through through-holes formed in a substrate. FIG. **8**B is a front view of FIG. **8**A. In these figures, reference numeral **8** denotes a substrate on which a semiconductor element module is mounted; **9** a solder for mounting; and **10** one of through-holes made in the substrate **8**. FIG. **9**A is a side view of a semiconductor device in which a conventional semiconductor element module is mounted on a substrate through conductor patterns formed on a mounting surface of the substrate.

The conventional semiconductor element module and semiconductor device configured as described above has the following problems. When the semiconductor element module is mounted on the substrate **8** through the through-holes **10** made therein, the solder used for mounting (solder material used to solder the leads **6** through the through-holes **10**) is molten owing to heating so that a part of the molten solder flows into a slight gap formed between a package bottom and substrate **8** by a capillary phenomemon, thus short-circuiting the leads **6** to each other. Further, when the semiconductor module is mounted on the substrate through the conductor patterns **11** mounted on the mounting surface of the substrate **8**, the leads **6** must be shaped at a portion apart from the brazing materials **7** in order to maintain the connecting strength between the package **4** and leads **6**. Since the brazing materials **7** are located at a position near the bottom of the package, in order to satisfy the above requirement, the leads **6** will be shaped (outward bending) at a portion thereof apart from the package bottom. This increases the height of the semiconductor device after mounting.

SUMMARY OF THE INVENTION

The present invention has been accomplished in order to solve the above problem, and intends to provide a semiconductor element module and a semiconductor device which can prevent solder for mounting from flowing into a slight gap formed between a package bottom and a substrate by a capillary phenomenon when the semiconductor element module is mounted on the substrate through through-holes formed therein, thus preventing the leads from being short-circuited with each other.

When the semiconductor element module is mounted on a substrate through a conductor pattern provided on a mounting surface of the substrate, the leads must be shaped at positions apart from the brazing material so that the connecting strength between the package and leads are not attenuated. When the brazing material is located at a position apart from the bottom of the package, the present invention intends to provide a semiconductor element module and a semiconductor device which permits the lead to be molded at a position near to the package bottom to lower the height after mounting.

To achieve the above object, the semiconductor element module according to the first invention is structured so that a level differences is provided on the side of the package attaching plane of each of package sides so that a space is formed from each the plurality of leads.

The semiconductor device according to the second invention is structured to include a semiconductor element module according to the first invention and a substrate having conductor patterns and through-holes for connecting the conductor patterns to each other wherein each the leads is soldered to the substrate through each the though-holes so that the bottom of the package abuts on a mounting plane.

The semiconductor device according to the third invention is structured so as to include a semiconductor element module according to the first invention and a substrate having conductor patterns for lead connection on a mounting plane thereof wherein each the leads is soldered to the substrate through each the conductor patterns so that the bottom of the package forms a prescribed space from the mounting plane.

The semiconductor element module according to the fourth invention is structured to further include brazing materials for connecting the package and each the leads and so that the level difference forms a space permitting each the leads to be shaped at its portion near to the package.

The semiconductor element module according to the fifth invention is structured so that the level-difference formed in the first or fourth invention serves to prevent the short-circuiting between the leads adjacent to each other.

The semiconductor element module according to the sixth invention is structured so that a level differences is provided at a portion of each the leads not connected to the package so that the width of each the leads on the side where the lead and package are connected is thick and that on the side of its opening end is thin.

The semiconductor device according to the seventh invention is constructed to includes a semiconductor element module according to the sixth invention and a substrate having conductor patterns and through-holes for connecting the conductor patterns to each other wherein each the leads is soldered to the substrate through each the though-holes so that the level difference of each the leads abuts on a mounting plane of the substrate.

The semiconductor device according to the eighth invention is structured so as to include a semiconductor element module according to the sixth invention and a substrate having conductor patterns for lead connection on a mounting plane thereof wherein each the leads is soldered to the substrate through each the conductor patterns so that the

bottom of the package forms a prescribed space from the mounting plane of the substrate.

The semiconductor element module according to the ninth invention is structured to further include brazing materials for connecting the package and each the leads and so that the level difference provides different mechanical strengths permitting each the leads to be shaped at its portion near to the package.

The semiconductor element module according to the tenth invention is structured so that the level difference formed in the semiconductor element module according to the sixth or ninth invention serves to prevent the short-circuiting between the leads adjacent to each other.

The semiconductor element module according to the eleventh invention is structured so that the semiconductor element is an optical element.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1A** to **1C** are a side view, a sectional view thereof and a front view taken in line A—A' of a semiconductor module according to a first embodiment of the present invention, respectively;

FIGS. **2A** and **2B** are a side view and a front view of a semiconductor device in which a semiconductor module according to the first embodiment is mounted on a substrate through the through-holes formed therein, respectively;

FIGS. **3A** and **3B** are a side view and a front view of a semiconductor device in which a semiconductor module according to a second embodiment is mounted on a substrate through the conductor patterns provided on the substrate, respectively;

FIGS. **4A** to **4C** are a side view, a sectional view thereof and a front view taken in line A—A' of a semiconductor module according to a third embodiment of the present invention, respectively;

FIGS. **5A** and **5B** are a side view and a front view of a semiconductor device in which a semiconductor module according to the third embodiment is mounted on a substrate through the through-holes formed therein, respectively;

FIGS. **6A** and **6B** are a side view and a front view of a semiconductor device in which a semiconductor module according to the fourth embodiment is mounted on a substrate through the conductor patterns provided on the substrate, respectively;

FIGS. **7A** to **7C** are a side view, a sectional view thereof and a front view taken in line A—A' of a conventional semiconductor module, respectively;

FIGS. **8A** and **8B** are a side view and a front view of a semiconductor device in which the conventional semiconductor module is mounted on a substrate through the through-holes formed therein, respectively; and

FIGS. **9A** and **9B** are a side view and a front view of a semiconductor device in which the conventional semiconductor element module is mounted on a substrate through the conductor patterns provided on the substrate, respectively.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, a description will be given in more detail of preferred embodiments of the present invention with reference to the accompanying drawings.

Embodiment 1

FIG. **1A** is a side view of the first embodiment of the invention; and FIG. **1B** is a sectional view of FIG. **1A**; FIG. **1A** is a front view taken along line A—A' in FIG. **1A**. In these figures, reference numerals **1–7** refer to like parts in the conventional semiconductor module and semiconductor device. Reference numeral **12** denotes one of grooved level differences each forming a space between the lead **6** and the side of the package attaching plane of sides of the package. FIG. **2A** is a side view showing a semiconductor device in which a semiconductor element module according to the present invention is mounted on a substrate through through-holes provided therein. FIG. **2B** is a front view thereof. In these figures, reference numerals **1** to **10** refer to like parts in the conventional semiconductor element module and semiconductor device shown in FIG. **8**. The package **4** is soldered to the substrate **8** through the through-holes **10** so that its bottom abuts on the mounting plane. However, since the grooved level difference **12** is formed so that the bottom of the package **4** is not brought into contact with the conductor pattern formed on the periphery of the through-holes and solder used for mounting, when the leads **6** are soldered through the through-holes **10**, a part of molten solder will not flow into the slight gap formed between the package bottom and substrate by the capillary phenomenon and hence the leads will not be short-circuited with each other.

Embodiment 2

FIG. **3A** is a side view of a semiconductor device in which a semiconductor element module according to the present invention is mounted on a substrate through a conductor pattern formed on a mounting plane of the substrate. FIG. **3B** is a front view thereof. In these figures, reference numerals **1–9** and **11** refer to like parts in the conventional semiconductor element module and semiconductor device shown in FIG. **9**. Reference numeral **12** corresponds to the grooved level differences shown in FIGS. **1A** to **1C** and **2A**, **2B**. The package **4** is soldered to the substrate **8** through the conductor pattern so that its bottom forms a prescribed space from a mounting plane of the substrate. In this case, since the grooved level difference **12** is formed so that a gap is provided between the bottom of the package **4** and the solder **7**, the brazing material **7** is located apart from the package bottom. Hence, the lead can be bent outwardly at a portion thereof near to the package bottom. In mounting, even if the lead **6** is bent outwardly at the position near to the bottom of the package **4**, the package can be mounted without attenuating the connecting strength between the package **4** and the lead. Thus, the height of the semiconductor device after mounting can be lowered compared with the conventional semiconductor device.

Embodiment 3

FIG. **4A** is a side view showing the third embodiment according to the present invention. FIG. **4B** is a sectional view of FIG. **4A**. FIG. **4C** is a front view taken in line A—A' of FIG. **4A**. In these figures, reference numerals **1** to **7** refer to like parts of the conventional element module and semiconductor device. Reference numeral **13** denotes one of lead level differences, provided at a portion of the lead **6** not connected to the package **4** so that the side where the lead **6** and the package **4** are connected is thick while the side of the opening end is thin. FIG. **5A** is a side view of a semiconductor device in which the semiconductor element module is mounted on the substrate through through-holes therein. FIG. **5B** is a front view thereof. In these figures, reference numerals **1** to **10** refer to like parts of the conventional semiconductor element module and semiconductor device shown in FIGS. **7** and **8**. In this case, the above lead level difference **13** is provided so that its width on the side where the lead **6** and package **4** are connected is larger than

11. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package.

12. A semiconductor element module according to claim 11, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

13. A semiconductor element module according to claim 12, wherein said brazing material is disposed at a location remote from the bottom surface of said package.

14. A semiconductor element module according to claim 11 wherein said leads extend along and are attached to a side surface of said package.

15. A semiconductor element module according to claim 11, wherein said semiconductor element is an optical element.

16. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate, said semiconductor element module including:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of

said package so as to form a space between said leads and said package.

17. A semiconductor device according to claim 16, wherein said substrate has a mounting surface and conductor patterns formed on said mounting surface, said semiconductor element module being mounted on said substrate by joining said open end portions of said leads to said conductor patterns.

18. A semiconductor device according to claim 16, further comprising a brazing material disposed within said level difference to secure the connection of said leads to said package.

19. A semiconductor device according to claim 16, wherein said semiconductor element is an optical element.

20. A semiconductor device according to claim 16, wherein said substrate has a mounting surface, said semiconductor element module being mounted on said substrate so that the bottom surface of said package is spaced from said mounting surface of said substrate by a prescribed distance.

21. A semiconductor element module, comprising:

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening.

22. A semiconductor element module, comprising;

a package having an inner bottom surface and an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than the inner bottom surface of said package.

23. A semiconductor element module according to claim 22, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

24. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate,

said semiconductor element module including;

a package having an inner bottom surface and an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than the inner bottom surface of said package.

25. A semiconductor element module, comprising;

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a mount having said optical element placed thereon for fixing said optical element to said package;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than a bottom surface of said mount.

26. A semiconductor element module according to claim 25, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

27. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate,

said semiconductor element module including;

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a mount having said optical element placed thereon for fixing said optical element to

said package;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than a bottom surface of said mount.

28. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion having a tip which is downwardly protruded from a plane including a bottom surface of said package and which is oriented in an outward direction relative to said side surface of said package; and

a level difference at said side surface of the package adjacent to said bottom surface of the package so as to form a space between said leads and said package.

29. A semiconductor element module according to claim 28, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

30. A semiconductor element module according to claim 28, wherein said level difference has a surface which intersects the side surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom, and further including a brazing material which is disposed between the surface of said level difference and the downwardly protruding portion of the leads to secure the attachment of said leads to said package.

31. A semiconductor element module according to claim 28, wherein each of said leads has an uppermost end, and a distance between the bottom surface of said package and the uppermost end of each of said leads is larger than the distance between the tip of the open end of each of said leads and the bottom surface of said package.

32. A semiconductor element module according to claim 28, wherein said level difference has a surface which intersects the side surface of said package, and a distance between the bottom surface of said package and the surface of said level difference is larger than the distance between the tip of the open end of each of said leads and the bottom surface of said package.

33. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package;

a level difference formed by a surface which intersects the side surface of said package adjacent to the bottom surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom so as to form a space between said leads and said package; and

a brazing material disposed between the surface of said level difference and the downwardly protruding portion of the leads to secure the attachment of said leads to said package.

34. A semiconductor element module according to claim 33, wherein said brazing material is disposed at a location remote from the bottom surface of said package.

35. A semiconductor element module, comprising:

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit, said

plurality of leads each having one end portion attached along a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening.

36. A semiconductor element module, comprising:

a semiconductor element;

a package having walls that surround said semiconductor element;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along the exterior surface of a side wall of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package;

a level difference that forms a recess away from the exterior surface of the side wall of said package adjacent to the bottom surface of said package, said recess having a width which is greater than the thickness of said side wall ; and

a brazing material disposed within said recess to secure the attachment of said leads to said package.

37. A semiconductor element module according to claim 36, wherein said brazing material is disposed at a location remote from the bottom surface of said package.

38. A semiconductor element module, comprising;

a package having an inner bottom surface and an opening for allowing an optical signal to pass therethrough;

an optical element located in said package and supported by said inner bottom surface, for outputting or inputting the optical signal;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of

said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than the inner bottom surface of said package.

39. A semiconductor element module according to claim 38, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

40. A semiconductor element module, comprising;

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a mount having said optical element placed thereon for fixing said optical element to said package;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than a bottom surface of said mount.

41. A semiconductor element module according to claim 40, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

42. A semiconductor element module, comprising;

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion for attachment to a mounting surface, said open end portion being downwardly protruded from a plane including a bottom surface of said package and being shaped to provide a space between the bottom surface of said package and the mounting surface;

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package; and

a brazing material disposed within said level difference to secure the connection of said leads to said package, to thereby enable said space between the bottom surface of said package and the mounting surface to be no greater than a prescribed amount.

43. A semiconductor element module according to claim 42, wherein said shape comprises an outward bending of the open end portion of the leads to define a mounting plane that is substantially parallel to said bottom surface at said prescribed distance therefrom.

44. A semiconductor element module according to claim 42, wherein said shape comprises a transition in the width of said leads that defines an abutment at said prescribed distance below the bottom surface of said package.

45. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate, said semiconductor element module including;

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion for attachment to a mounting surface, said open end portion being downwardly protruded from a plane including a bottom surface of said package and being shaped to provide a space between the bottom surface of said package and the mounting surface;

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package; and

a brazing material disposed within said level difference to secure the connection of

said leads to said package, to thereby enable said space between the bottom surface of said package and the mounting surface to be no greater than a prescribed amount.

46. A semiconductor element module according to claim 45, wherein said shape comprises an outward bending of the open end portion of the leads to define a mounting plane that is substantially parallel to said bottom surface at said prescribed distance therefrom.

47. A semiconductor element module according to claim 45, wherein said shape comprises a transition in the width of said leads that defines an abutment at said prescribed distance below the bottom surface of said package.

48. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate,

said substrate having a plurality of through-holes;

said semiconductor element module, including:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package, wherein each of said leads is inserted into a respective one of said through-holes, so that said semiconductor element module is soldered to said substrate through said through-holes; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package that accommodates the solder to keep said solder separate from the bottom of said package.

49. A semiconductor device according to claim 48, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.

50. A semiconductor device according to claim 48, wherein the bottom surface of said semiconductor element module abuts the substrate.

51. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate,

said substrate having a plurality of through-holes and conductor patterns;

said semiconductor element module, including:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached to a side surface of said package and another open end portion being downwardly protruded from a plane including a bottom surface of said package, at least one of said plurality of leads being connected to a high frequency terminal of said semiconductor element module; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package;

wherein each lead connected to a high frequency terminal is surface-mounted onto said conductor pattern, while each of the remaining leads is inserted into said each of said through-holes.

52. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion of a first width attached along a side surface of said package, an open end portion of a second, narrower width being downwardly protruded from a plane including a bottom surface of said package, and a level difference which defines a transition from said first width to said second width; and

a brazing material located at an edge of said package to secure the attachment of said leads to said package;

wherein said level difference is located lower than said brazing material.

53. A semiconductor element module according to claim 52, wherein each of said leads is bent at a point below said level difference.

54. A semiconductor device, comprising;

a substrate having a mounting surface on which conductor patterns are formed; and

a semiconductor element module having:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion of a first width attached along a side surface of said package, an open end portion of a second, narrower width being downwardly protruded from a plane including a bottom surface of said package, and a level difference which defines a transition from said first width to said second width, wherein each of said leads is bent at a point below said level difference; and

a brazing material located at an edge of said package to secure the attachment of said leads to said package, wherein said level difference is located lower than said brazing material;

wherein said open end portions of said leads on said semiconductor element module are soldered onto said conductor patterns so that a bottom of said package forms a prescribed space with said mounting surface.

55. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having a wide portion connected to a side surface of said package and a narrow portion that extends downwardly beyond the bottom surface of said package, wherein said wide portion extends below the bottom edge of said side surface.

56. The semiconductor package of claim 55 further including a level difference in said side surface of said package adjacent said bottom surface that forms a space between the wide portion of each lead that extends below the bottom edge of said side surface and the bottom of said package.

57. The semiconductor package of claim 56, further including a brazing material disposed within said level difference for securing the connection of said leads to said package.

58. The semiconductor package of claim 55, wherein said narrow portions of said leads are bent outwardly away from said package to form a mounting surface.

59. A semiconductor element module, comprising:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion having a tip which is downwardly protruded from a plane including a bottom surface of said package and which is oriented in an outward direction relative to said side surface of said package;

a level difference at said side surface of said package adjacent to said bottom surface of said package so as to form a space between said leads and said package;

wherein said level difference has a first surface which intersects the side surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom, and a second surface which intersects said first surface and which is substantially parallel to said side surface;

wherein said semiconductor element module further includes a brazing material that is disposed between said first surface and each of the downwardly protruding portions of the leads to secure the attachment of said leads to said package; and

wherein said brazing material forms a brazed joint fillet that is displaced from said second surface.

60. A semiconductor device comprising a substrate and a semiconductor element module mounted on said substrate, said semiconductor element module including:

a package;

a semiconductor element within said package;

a plurality of leads for connecting said semiconductor element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion having a tip which is downwardly protruded from a plane including a bottom surface of said package and which is oriented in an outward direction relative to said side surface of said package;

a level difference at said side surface of said package adjacent to said bottom surface of said package so as to form a space between said leads and said package;

wherein said level difference has a first surface which intersects the side surface of said package and which is substantially perpendicular to said side surface and a portion of the leads which protrude downwardly therefrom, and a second surface which intersects said first surface and which is substantially parallel to said side surface;

wherein said semiconductor element module further includes a brazing material that is disposed between said first surface and each of the downwardly protruding portions of the leads to secure the attachment of said leads to said package; and

wherein said brazing material forms a brazed joint fillet that is displaced from said second surface.

61. A semiconductor element module, comprising;

a package having an opening for allowing an optical signal to pass therethrough;

an optical element located in said package for outputting or inputting the optical signal;

a mount disposed between said optical element and said package;

a plurality of leads for connecting said optical element to an external circuit, said plurality of leads each having one end portion attached along a side surface of said package and another open end portion bent in an outward direction relative to the side surface of said package, said open end portion being downwardly protruded from a plane including a bottom surface of said package; and

a level difference at the side surface of said package adjacent to the bottom surface of said package so as to form a space between said leads and said package,

each of said leads having an uppermost end which is lower than an uppermost end of said opening, said level difference having a surface which intersects the side surface of said package, and the surface of said level difference being higher than a bottom surface of said mount.

62. A semiconductor element module according to claim 61, further comprising a brazing material disposed within said level difference to secure the attachment of said leads to said package.